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(33) **US**

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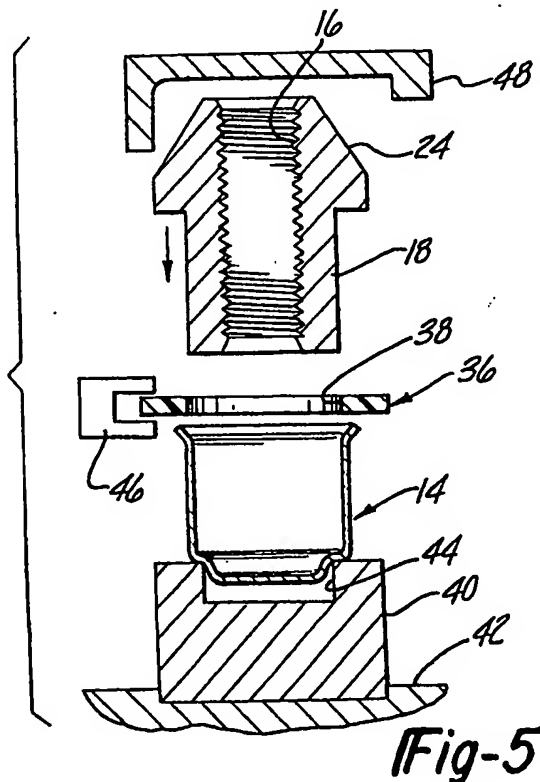
(58) Field of search

**F2H**

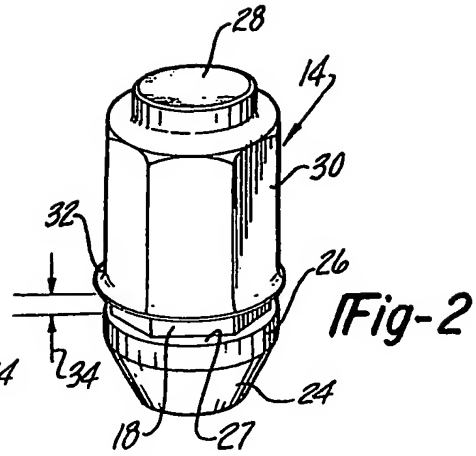
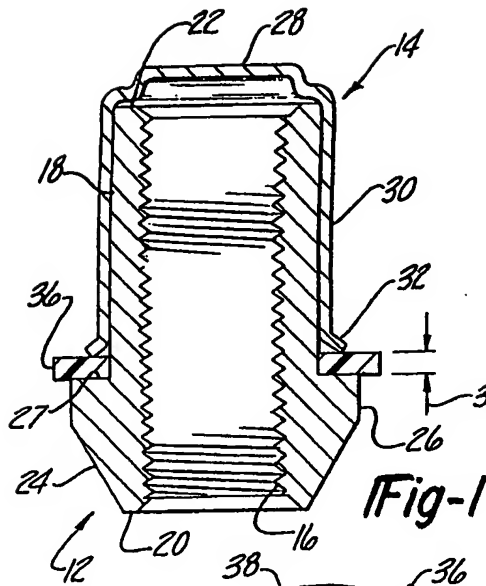
**Selected US specifications from IPC sub-class F16B**

(54) **Wheel nuts and method of making same**

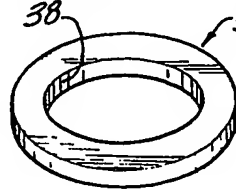
(57) A method of making a capped wheel nut comprises securing a cap (14) to a nut body (18, 24) so as to trap a retaining ring (36) between the cap (14) and a shoulder on the nut body (18, 24), the retaining ring (36) extending outwardly to retain a wheel cover against the wheel. Prior to placing the cap onto the wheel nut body, the nut body may be inserted through the unbroken retaining ring. The nut body and cap are thereafter secured together by force-fitting, or crimping, or welding.



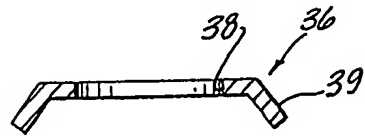
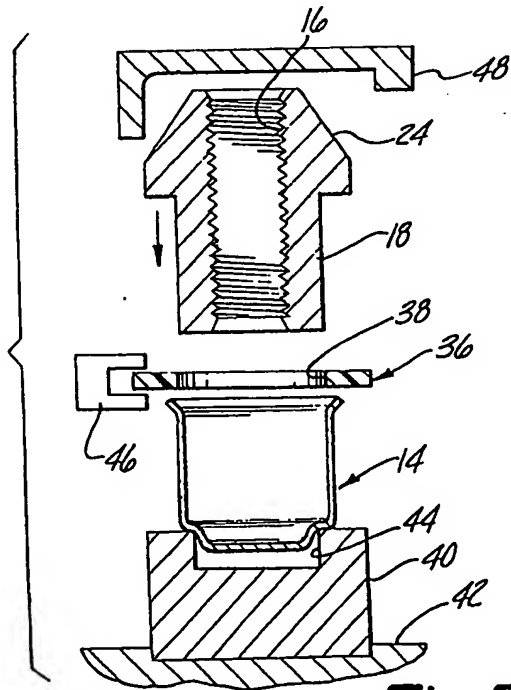
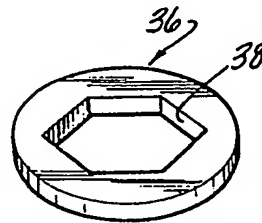
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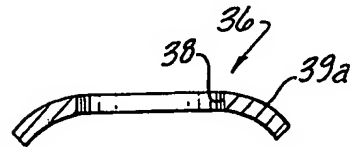
**Fig-3**



**Fig-4**



**Fig-6**



**Fig-7**

## SPECIFICATION

## Improved wheel nut and method of making same

5 This invention relates to wheel nuts and, more particularly, to an improved wheel nut and a method of making same, which wheel nut retains a wheel on a hub and simultaneously

10 retains a wheel cover on the wheel.

Wheel nuts for retaining a wheel on a hub and simultaneously retaining a wheel cover in position on the wheel are described in United Kingdom Patent application No. 85/28703

15 filed simultaneously with the present application. That co-pending application identifies several types of wheel nuts which utilize retaining rings. The present invention is directed to an improved method for making a capped wheel nut of the type which includes a retaining

20 ring, and to the resulting nut.

The above-identified patent application describes different forms of wheel nuts wherein a retaining ring is positioned either within a

25 groove or within a gap between the cap and the nut body. One of the advantages of the system described in the above-identified patent application, is that the wheel may be utilized to retain the wheel on the hub and the wheel covers may be suitably stored within

30 the boot of the vehicle during the interval between the manufacture of the vehicle and actual delivery to the user. At the time of delivery of the vehicle, each wheel cover, which

35 has suitable apertures to be aligned with the wheel nuts, may be removed from the boot and placed over the hub with the wheel nuts extending outwardly through apertures in the wheel cover, and then the retainer rings fastened in place on the capped wheel nut.

Should it be desired to remove the wheel cover for any reason, the retaining rings are first removed from the wheel nuts and then the wheel cover removed. However, the retaining rings are quite small and are easy to

45 misplace when they are removed from the wheel nuts.

The present invention provides an alternative approach for the use of the capped wheel nut including a retaining ring and provides an improved method for making the wheel nut with

50 retaining ring, and extends to the product resulting from the implementation of such method.

According to the present invention, a method is provided of making a capped wheel nut of the type including a nut body having a cap secured thereto and having a retaining ring adapted to retain a wheel cover on a

60 wheel, the method comprising the steps of providing a nut body having a central threaded aperture, a first end adapted to engage a wheel, a second end adapted to fit within a cap and a shoulder intermediate the first and

65 second ends; providing a retaining ring for the

nut body, which when mounted thereon extends radially outwardly beyond the nut body; providing a cap for the nut body, and securing the cap on the nut body to trap the retaining

70 ring on the body between the cap and the nut body shoulder.

Also according to the present invention, a method is provided of making a capped wheel nut of the type including a nut body having a cap secured thereto and a retaining ring trapped therebetween comprising the steps of providing a nut body having a central threaded aperture, a first end adapted to engage a wheel, a second end adapted to fit

75 within a cap and a shoulder intermediate the first and second ends; providing a cap having a first portion adapted to cover the second end of the nut body, a second portion adapted to cover the sides of the nut body and terminating in a third portion; providing a

80 retaining ring;

inserting the second end of the nut body through the retaining ring and into the cap; and

90 securing the cap and nut body together to trap the retaining ring between the cap and the nut body.

The invention also extends to capped wheel nuts made according to the afore-mentioned

95 methods.

It should be understood that in the explanation of the present invention, the movement of the nut body into the cap, for example, is considered to be relative movement and equivalent to moving the cap onto the nut body and also equivalent to moving both the cap and the nut body toward each other.

With a retaining ring trapped between the cap and the nut body, it is necessary to remove the wheel nut completely from the wheel in order to remove the wheel cover without deliberately damaging the retaining ring. The capped wheel nut with the retaining ring trapped between the cap and the nut

100 body provides the advantage that the retaining ring is less likely to be accidentally knocked off and lost.

The present invention will now be further described by way of example, with reference to and as illustrated in the accompanying drawings, in which:

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Figure 1 is a sectional view of a capped wheel nut including a retaining ring assembled according to the method of the present invention;

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Figure 2 is a perspective illustration of the capped wheel nut of Figure 1 with the retaining ring removed for illustrative purposes;

Figure 3 is a perspective illustration of one form of the retaining ring;

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Figure 4 is a perspective illustration of second form of a retaining ring.

Figure 5 is a sectional view, partly diagrammatic, illustrating a method of assembling the capped wheel nut with retaining ring; and

130

Figures 6 and 7 illustrate additional variations for the configuration of the retaining ring.

With reference to Figure 1, a capped wheel nut is illustrated in sectional view. Typically, the capped wheel nut includes a steel nut body 12 and a stainless steel cap 14.

The nut body 12, often called a nut insert, has a central threaded aperture 16 and a plurality of wrench flats 18 arranged generally parallel to the elongated axis of the nut body. It is conventional to provide six such wrench flats and thus in an end view the nut body is of hexagonal configuration.

The nut body has first and second ends 20, 22 and the first end is typically formed with a conical surface 24 that is adapted to mate with the conical depressions typically formed around stud holes in vehicle wheels. The conical section 24 terminates in a short cylindrical land 26. At the top of the land 26, the nut body may be provided with a shoulder 27. The land 26 is like a radial flange on the nut body.

The nut body 12 is covered by a sheath or cap preferably formed of stainless steel. The cap includes a top 28 which may be domed, flat or recessed. The top 28 of the cap is a first portion of the cap, the interior of which covers the second end 22 of the nut body. A second portion of the cap is a downwardly extending skirt 30 which extends over the wrench flats 18. The skirt portion may be configured in plan view to correspond to the wrench flats and thus if the wrench flats are hexagonal then the skirt portion 30 will be hexagonal. The free end 32 of the skirt portion 30, i.e., the end of the cap opposite the top 28, may extend radially outwardly a short distance and may correspond in outside diameter to the outside diameter of the land 26 of the nut body or may (as shown) be of a somewhat smaller diameter. This free end 32 may be considered the third portion of the cap.

There will be an axial gap 34 between the free end 32 of the cap and the land 26 and shoulder 27 of the nut as illustrated in greater detail in Figure 2.

Referring back to Figure 1, a retaining ring 36 is provided in the axial gap between the free end 32 of the cap 14 and shoulder 27 on the nut body 12. The retaining ring may be formed of carbon steel, stainless steel, nylon, synthetic plastic or the like. The retaining ring 36 is a thin annulus having an interior surface 38. The ring 36 may be flat as illustrated in Figures 1 to 5 or may be flat with a conical flange 39, as illustrated in Figure 6. The ring may be generally concave as oriented toward the wheel cover and in such a configuration the ring 36 includes a generally curved flange 39a (Figure 7). Any non-flat portion should be oriented toward the wheel cover so that any resiliency functions to retain the

cover on the wheel.

With reference to Figures 1, 2 and 3, a first method of assembling the retaining ring and capped wheel nut will now be explained. The retaining ring may be placed on the nut body such as by inserting the second end 22 of the nut body through the retaining ring 36. The interior surface 38 of the retaining ring need not be a tight fit against the outside diameter of the nut body. Then the cap 14 may be inserted over the nut body (or alternatively the end 22 of the nut body inserted into the cap) until the nut body is fully extended within the cap. The free end 32 of the cap may assist in moving the retaining ring along the nut body toward the shoulder 27 and with the retaining ring positioned on the shoulder 27, the retaining ring is thus trapped between the nut body shoulder and the cap.

With reference to Figure 3, the retaining ring 36 may be thought of as a thin disk having a central bore therethrough. If the bore is circular then the interior surface 38 formed in the ring will be circular in plan view. The present invention contemplates, however, that the configuration of the interior surface 38 of the retaining ring may match the configuration of the nut body and thus if the nut is provided with six wrench flats 18 then the interior surface 38 may be formed of a hexagonal configuration as illustrated in Figure 4.

According to the principles of the present invention, when the nut body and cap are secured together to trap the retaining ring therebetween the cap may be a force fit, be crimped, welded or otherwise secured to the nut body.

Figure 5 illustrates, diagrammatically, the method for making the improved wheel nut. The configuration of Figure 5 has particular utility in the welding of capped wheel nuts to a nut body but the use is not limited to welding. A lower die 40 mounted on a bed 42 is provided with an upwardly opening recess 44. The recess 44 within the lower die 40 is configured such that the cap 14 may be positioned within the recess with the free end of the cap extending upwardly. A mechanical holder 46 may be utilized to support the retaining ring 36 at the free end 32 of the cap. An upper die 48 configured to mate with the conical surface 24 of the nut body is moved into contact with the nut body and the upper die moved toward the lower die such that the nut body is forced through the retaining ring and into the cap again trapping the retaining ring therebetween. The type of die members generally described above may be used as part of a welding system to weld the cap to the nut body as described in U.S. Patent Specification No. 4,123,961. However, the steps of positioning the cap opening upwardly, positioning the retaining ring thereabove, and thereafter inserting the nut body through the retaining ring and into the cap should not be

interpreted as requiring welding.

The foregoing is a complete description of the method of making the improved wheel nut. It should be appreciated that numerous changes and modifications may be made without departing from the scope of the present invention as defined in the following claims.

#### CLAIMS

10 1. A method of making a capped wheel nut of the type including a nut body having a cap secured thereto and having a retaining ring adapted to retain a wheel cover on a wheel, the method comprising the steps of providing  
15 a nut body having a central threaded aperture, a first end adapted to engage a wheel, a second end adapted to fit within a cap and a shoulder intermediate the first and second ends; providing a retaining ring for the nut  
20 body which, when mounted thereon extends radially outwardly beyond the nut body; providing a cap for the nut body, and securing the cap on the nut body to trap the retaining ring on the body between the cap and the nut  
25 body shoulder.

2. A method as claimed in claim 1, wherein the cap has a first portion to cover the second end of the nut body, a second portion for covering the sides of the nut body,  
30 and a third portion for trapping the retaining ring between the cap and the nut body shoulder.

3. A method of making a capped wheel nut of the type including a nut body having a cap secured thereto and a retaining ring trapped therebetween comprising the steps of providing a nut body having a central threaded aperture, a first end adapted to engage a wheel, a second end adapted to fit within a cap and a  
40 shoulder intermediate the first and second ends; providing a cap having a first portion adapted to cover the second end of the nut body, a second portion adapted to cover the sides of the nut body and terminating in a  
45 third portion; providing a retaining ring;

inserting the second end of the nut body through the retaining ring and into the cap; and  
securing the cap and the nut body together  
50 to trap the retaining ring between the cap and the nut body.

4. A method as claimed in claim 1, 2 or 3 comprising welding the cap to the nut body.

5. A method as claimed in claim 1, 2 or 3  
55 wherein the cap is force fitted to the nut body.

6. A capped wheel nut when made according to the method of any one of claims 1 to 5.

60 7. A capped wheel nut as claimed in claim 6, wherein the retaining ring is a synthetic plastic.

8. A capped wheel nut as claimed in claim 6, wherein the retaining ring is steel.

65 9. A capped wheel nut as claimed in claim

8 wherein the retaining ring is stainless steel.

10. A capped wheel nut as claimed in claim 8, wherein the retaining ring is carbon steel.

11. A capped wheel nut as claimed in any  
70 one of claims 6 to 10, wherein the retaining ring is flat.

12. A capped wheel nut as claimed in any one of claims 6 to 11, wherein the nut body has polygonal sides intermediate the shoulder and its second end, and the cap is configured to extend over these polygonal sides.  
75

13. A capped wheel nut as claimed in claim 12, wherein the nut body has six sides.

14. A capped wheel nut as claimed in claim  
80 12 or 13, wherein the retaining ring has an inside surface configured to conform to the sides of the nut body and the step of securing the cap to the nut body or inserting the nut body through the retaining ring includes  
85 aligning the retaining ring on the sides of the nut body.

15. A method of making a capped wheel nut, substantially as hereinbefore described with reference to the accompanying drawings.

90 16. Capped wheel nuts when made according to the method of claim 15 and substantially as herein described with reference to and as illustrated in the accompanying drawings.

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